

What is claimed is:

1. A base station apparatus comprising:

5 a scheduler that determines a schedule to transmit transmission data to communication terminal apparatuses based on communication quality for subcarrier blocks obtained by dividing a multicarrier communication band into a plurality of portions;

10 a subcarrier block selection section that arranges transmission data in subcarrier blocks whose communication quality is equal to or higher than predetermined quality for the respective communication terminal apparatuses;

15 a frequency hopping section that subjects transmission data to frequency hopping in predetermined time units and arranges the transmission data in subcarriers in the subcarrier blocks; and

a transmission section that transmits the transmission data arranged in the subcarriers.

20 2. The base station apparatus according to claim 1, wherein said subcarrier block selection section subjects the subcarrier blocks to hopping in predetermined time units.

25 3. A communication terminal apparatus comprising:

a subcarrier block extraction section that separates a received signal into subcarrier blocks obtained by dividing a multicarrier communication band

into a plurality of portions;

a reproduction section that reproduces a received signal subjected to hopping within the subcarrier blocks;

5 a CIR measuring section that measures a CIR of the received signal;

a CQI generation section that generates CQI indicating a transmission rate requested based on said CQI; and

10 a transmission section that transmits said CQI.

4. The communication terminal apparatus according to claim 3, wherein said CIR measuring section comprises:

15 a signal power calculation section that calculates power of desired signals from the received signal in subcarrier block units;

an interference power calculation section that calculates power of interference signals from the received signal in subcarrier block units;

20 an averaging section that calculates an average value of power of interference signals in a plurality of subcarrier blocks; and

25 a CIR calculation section that calculates a CIR from power values of said desired signals and average power value of said interference signals in subcarrier block units.

5. A radio communication method comprising the steps of:

determining a schedule for transmitting transmission data to a plurality of communication terminal apparatuses based on CQI transmitted from the respective communication terminal apparatuses;

5 calculating communication quality for the communication terminal apparatuses in units of subcarrier blocks obtained by dividing a multicarrier communication band into a plurality of portions, arranging transmission data in subcarrier blocks whose communication quality
10 is equal to or higher than predetermined quality for the respective communication terminal apparatuses;

arranging the transmission data subjected to frequency hopping in predetermined time units in subcarriers in the subcarrier blocks and transmitting
15 the transmission data arranged in the subcarriers;

separating the received signal into subcarrier blocks obtained by dividing a multicarrier communication band into a plurality of portions;

reproducing the received signal subjected to hopping
20 in the subcarrier blocks; and

measuring a CIR of the received signal, generating CQI indicating a transmission rate requested based on said CIR and transmitting said CQI.

ABSTRACT

In order to reduce interference between cells through hopping and use frequencies in a good propagation situation, a scheduler section 102 carries out scheduling for determining to which user data should be sent using CQI from each communication terminal apparatus, selects a user signal to be sent in the next frame and determines in which subcarrier block the data should be sent. An MCS decision section 103 selects a modulation scheme and coding method from the CQI of the selected user signal. A subcarrier block selection section 110 selects a subcarrier block instructed by the scheduler section 102 for each user signal. For the respective subcarrier blocks, FH sequence selection sections 111-1 to 111-n select hopping patterns. A subcarrier mapping section 112 maps the user signal and control data to subcarriers according to the selected hopping pattern.

[FIG.1]

TRANSMISSION DATA (USER 1)

TRANSMISSION DATA (USER 2)

TRANSMISSION DATA (USER 3)

5 CQI FROM MOBILE STATION

11 SCHEDULER SECTION

12 CODING SECTION

13 TRANSMISSION HARQ SECTION

14 MODULATION SECTION

10 CONTROL DATA

15 CONTROL DATA PROCESSING SECTION

16 CODING SECTION

17 MODULATION SECTION

FH PATTERN

15 18 MULTIPLEXING SECTION

19 SUBCARRIER MAPPING SECTION

PILOT SIGNAL

20 S/P CONVERSION SECTION

21 IFFT SECTION

20 22 GI INSERTION SECTION

23 RADIO PROCESSING SECTION

[FIG.2]

RM PARAMETER

25 21 BUFFER

22 RATE MATCHING

[FIG.3]

1 BLOCK (= N SUBCARRIERS)
FREQUENCY
TIME (SYMBOL)
PILOT
5 DATA

[FIG.4]

51 RADIO PROCESSING SECTION
52 GI ELIMINATION SECTION
10 53 FFT SECTION
FH PATTERN
54 SUBCARRIER DEMAPPING SECTION
55 CHANNEL SEPARATION SECTION
56 DEMODULATION SECTION
15 57 DECODING SECTION
CONTROL DATA
58 DEMODULATION SECTION
59 RECEPTION HARQ SECTION
60 DECODING SECTION
20 USER DATA
62 CIR MEASURING SECTION
64 TRANSMISSION SECTION
63 CQI GENERATION SECTION
61 ACK/NACK GENERATION SECTION
25

[FIG.5]
TRANSMISSION DATA (USER 1)
TRANSMISSION DATA (USER 2)

TRANSMISSION DATA (USER 3)

- 102 SCHEDULER SECTION
- 101 RECEPTION SECTION
- 103 MCS DECISION SECTION
- 5 MCS INFORMATION
 - 104-1 CODING SECTION
 - 104-2 CODING SECTION
 - 105-1 TRANSMISSION HARQ SECTION
 - 105-2 TRANSMISSION HARQ SECTION
- 10 106-1 MODULATION SECTION
- 106-2 MODULATION SECTION
- SUBCARRIER BLOCK INFORMATION
- CONTROL DATA
- 108 CODING SECTION
- 15 109 MODULATION SECTION
- 107 CONTROL DATA PROCESSING SECTION
- 110 SUBCARRIER BLOCK SELECTION SECTION
- FH SEQUENCE
 - 111-1 FH SEQUENCE SELECTION SECTION
 - 20 111-2 FH SEQUENCE SELECTION SECTION
 - 111-n FH SEQUENCE SELECTION SECTION
- PILOT SIGNAL
 - 112 SUBCARRIER MAPPING SECTION
 - 113 S/P CONVERSION SECTION
 - 25 114 IFFT SECTION
 - 115 GI INSERTION SECTION
 - 116 RADIO PROCESSING SECTION

[FIG.6]

SUBCARRIER BLOCK

FREQUENCY

1 FRAME

- 5 ASSIGNMENT TO USER 1
- ASSIGNMENT TO USER 2
- ASSIGNMENT TO CONTROL DATA

[FIG.7]

- 10 201 RADIO PROCESSING SECTION
- 202 GI ELIMINATION SECTION
- 203 FFT SECTION
- SUBCARRIER BLOCK ASSIGNMENT INFORMATION
- 204 SUBCARRIER BLOCK EXTRACTION SECTION
- 15 FH SEQUENCE ASSIGNMENT INFORMATION
- 205-1 DATA SEQUENCE REPRODUCTION SECTION
- 205-2 DATA SEQUENCE REPRODUCTION SECTION
- 206-1 DEMODULATION SECTION
- 206-2 DEMODULATION SECTION
- 20 207 DECODING SECTION
- CONTROL DATA
- 208 RECEPTION HAPQ SECTION
- 209 DECODING SECTION
- 211 PILOT SIGNAL EXTRACTION SECTION
- 25 212 CIR MEASURING SECTION
- 214 TRANSMISSION SECTION
- 213 CQI GENERATION SECTION
- 210 ACK/NACK GENERATION SECTION

USER DATA

CRC RESULT

[FIG.8]

- 5 EACH BLOCK PILOT SIGNAL
- CALCULATION UNIT FOR EACH BLOCK
- 301-1 SIGNAL POWER CALCULATION SECTION
- 302-1 INTERFERENCE POWER CALCULATION SECTION
- 303-1 CIR CALCULATION SECTION
- 10 301-2 SIGNAL POWER CALCULATION SECTION
- 302-1 INTERFERENCE POWER CALCULATION SECTION
- 303-2 CIR CALCULATION SECTION
- 301-3 SIGNAL POWER CALCULATION SECTION
- 302-3 INTERFERENCE POWER CALCULATION SECTION
- 15 303-3 CIR CALCULATION SECTION
- BLOCK 1 CIR
- BLOCK 2 CIR
- BLOCK 3 CIR

20 [FIG.9]

- TRANSMISSION DATA (USER 1)
- TRANSMISSION DATA (USER 2)
- TRANSMISSION DATA (USER 3)
- 102 SCHEDULER SECTION
- 25 101 RECEPTION SECTION
- 103 MCS DECISION SECTION
- 104-1 CODING SECTION
- 104-2 CODING SECTION

MCS INFORMATION

105-1 TRANSMISSION HARQ SECTION

105-2 TRANSMISSION HARQ SECTION

106-1 MODULATION SECTION

5 106-2 MODULATION SECTION

SUBCARRIER BLOCK INFORMATION

CONTROL DATA (SPEECH DATA)

411 CODING SECTION

412 MODULATION SECTION

10 401 CONTROL DATA PROCESSING SECTION

403 SUBCARRIER BLOCK HOPPING SEQUENCE GENERATION
SECTION

402 SUBCARRIER BLOCK SELECTION SECTION

FH SEQUENCE

15 111-1 FH SEQUENCE SELECTION SECTION

111-2 FH SEQUENCE SELECTION SECTION

111-n FH SEQUENCE SELECTION SECTION

PILOT SIGNAL

112 SUBCARRIER MAPPING SECTION

20 113 S/P CONVERSION SECTION

114 IFFT SECTION

115 GI INSERTION SECTION

116 RADIO PROCESSING SECTION

25 [FIG.10]

SUBCARRIER BLOCK

SUBCARRIER BLOCK HOPPING FOR CONTROL DATA

FREQUENCY

1 FRAME

ASSIGNMENT TO USER 1

ASSIGNMENT TO USER 2

ASSIGNMENT TO CONTROL DATA

5

[FIG.11]

PILOT SIGNAL FOR EACH BLOCK

CALCULATION UNIT FOR EACH BLOCK

301-1 SIGNAL POWER CALCULATION SECTION

10 302-1 INTERFERENCE POWER CALCULATION SECTION

301-2 SIGNAL POWER CALCULATION SECTION

302-1 INTERFERENCE POWER CALCULATION SECTION

301-3 SIGNAL POWER CALCULATION SECTION

302-3 INTERFERENCE POWER CALCULATION SECTION

15 601 INTERFERENCE POWER AVERAGING SECTION

602-1 CIR CALCULATION SECTION

602-2 CIR CALCULATION SECTION

602-3 CIR CALCULATION SECTION

BLOCK 1 CIR

20 BLOCK 2 CIR

BLOCK 3 CIR

[FIG.12]

FADING POWER

25 OPERATING FREQUENCY BAND

[FIG.13]

FADING POWER

OPERATING FREQUENCY BAND

[FIG.14]

1 BLOCK

5 1 BLOCK

CELL A

CELL B

CELL C

BLOCK SIZE INFORMATION

10 1 BLOCK

CONTROL STATION

[FIG.15]

851 DELAY INFORMATION RECEPTION SECTION

15 852 BLOCK SIZE DETERMINING SECTION

853 TRANSMISSION SECTION

802 DELAY VARIANCE CALCULATION SECTION

803 BLOCK SIZE INFORMATION RECEPTION SECTION

801 RECEPTION SECTION

20 TRANSMISSION DATA (USER 1)

TRANSMISSION DATA (USER 2)

TRANSMISSION DATA (USER 3)

804 SCHEDULER SECTION

103 MCS DECISION SECTION

25 104-1 CODING SECTION

104-2 CODING SECTION

MCS INFORMATION

105-1 TRANSMISSION HARQ SECTION

- 105-2 TRANSMISSION HARQ SECTION
- 106-1 MODULATION SECTION
- 106-2 MODULATION SECTION
- 805 SUBCARRIER BLOCK SELECTION SECTION
- 5 FH SEQUENCE
 - 111-1 FH SEQUENCE SELECTION SECTION
 - 111-2 FH SEQUENCE SELECTION SECTION
 - 111-n FH SEQUENCE SELECTION SECTION
 - 112 SUBCARRIER MAPPING SECTION
- 10 SUBCARRIER BLOCK INFORMATION
 - CONTROL DATA
 - 108 CODING SECTION
 - 109 MODULATION SECTION
 - 107 CONTROL DATA PROCESSING SECTION
- 15 PILOT SIGNAL
 - 113 S/P CONVERSION SECTION
 - 114 IFFT SECTION
 - 115 GI INSERTION SECTION
 - 116 RADIO PROCESSING SECTION